Tables

TABLE 4.1

INITIAL ICM PERFORMANCE DATA

Former Amphenol Site
Franklin, Indiana

Well ID	Top of Casing Elevation (feet, MSL	Initial Conditions, 2/14/95		2/16/95 to 2/23/95		2/23/95 to 3/2/95		Change in Water Elevation (feet)
		Depth to Water (feet)	Water Elevation (feet, MSL)	Depth to Water (feet)	Water Elevation (feet, MSL)	Depth to Water (feet)	Water Elevation (feet, MSL)	
IT-2	732.25	13.00	719.25	13.25	719.00	13.15	719.10	-0.15
IT-3	728.71	11.10	717.61	11.20	717.51	11.18	717.53	-0.08
MW-3	736.44	16.53	719.91	16.55	719.89	16.49	719.95	+0.04
MW-9	733.04	12.11	720.93	11.82	721.22	11.80	721.24	+0.31
MW-12	736.38	17.06	719.32	17.28	719.10	17.27	719.11	-0.21
MW-20	734.03	n/a	n/a	n/a	n/a	n/a	n/a	n/a
MW-21	737.91	18.06	719.85	18.03	719.88	18.02	719.89	+0.04
MW-22	737.64	17.97	719.67	18.03	719.61	18.12	719.52	-0.15
MW-24	736.02	16.55	719.47	16.85	719.17	16.55	719.47	0.0
MW-26	736.39	15.48	720.91	15.81	720.58	15.19	721.20	+0.29
MW-27	736.63	16.76	719.87	16.54	720.09	16.60	720.03	+0.16
MW-28	738.04	18.27	719.77	18.18	719.86	18.21	719.83	+0.06
MW-29	737.61	18.03	719.58	17.92	719.69	17.92	719.69	+0.11
MW-30	734.84	15.74	719.10	15.70	719.14	15.72	719.12	+0.02

Notes:

(1) RW-1: Pumped approximately 5,760 gallons during the time period 2/16/95 to 3/2/95.

(2) RW-2: Pumped approximately 65,047 gallons (3.3 gpm) during the time period 2/16/95 to 3/2/95.

(3) RW-3: Pumped approximately 110,993 gallons (5.5 gpm) during the time period 2/16/95 to 3/2/95.

(4) n/a - data not available

TABLE 5.1

GROUNDWATER AND SOIL ARARs

Former Amphenol Site
Franklin, Indiana

Chemical	Final Risk-Based PRG Concentrations for Soil (residential) (mg/kg)	Final Risk-Based PRG Concentrations for Ground Water (ug/L)	Maximum Contaminant Level (MCL) (ug/L)	Maximum Contaminant Level Goal (MCLG) (ug/L)	RCRA Subpart S Action Levels (P)	
					Soil (mg/kg)	Ground Water (ug/L)
Acetone	27400	3650	#N/A	#N/A	8000	4000
2-Butanone	164000	2500	#N/A	#N/A	50000	20000
Carbon tetrachloride	4.91	0.259	5	Zero	5	MCL
Chloroform	105	0.275	80(T)	Zero	100	MCL
1,1-Dichloroethane	27400	768	#N/A	#N/A	8000	4000
1,1-Dichloroethylene	1.06	0.0167	7	7	10	MCL
1,2-Dichloroethene	2460	329	70(cis)	70(cis)	700	MCL
Methylene Chloride	85.2	6.31	5	Zero	90	MCL
4-Methyl-2-pentanone	21900	183	#N/A	#N/A	6000	3000
Tetrachloroethene	12.3	1.43	5	Zero	10	MCL
Toluene	1.6	0.213	1000	1000	2	MCL
1,1,1-Trichloroethane	24600	1550	200	200	7000	MCL
Trichloroethene	58.1	2.54	5	Zero	60	MCL
Xylene, total	548000	73000	10000	10000	200000	MCL
Aluminum	#N/A	#N/A	50(S)	#N/A	#N/A	#N/A
Antimony	110	14.6	6	6	30	MCL
Arsenic	0.355	0.0473	50(U)	#N/A	0.4	MCL
Barium	19200	2560	2000	2000	5000	MCL
Beryllium	0.149	0.0198	4	4	0.2	MCL
Cadmium	137	18.3	5	5	40	MCL
Calcium	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Chromium, VI	1370	183	100(total)	100(total)	400	MCL
Cobalt	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Copper	10200	1350	1300(A)	1300	3000	MCL
Cyanide	5480	730	200(P)	200(P)	2000	700
Iron	#N/A	#N/A	300(S)	#N/A	#N/A	#N/A
Lead	#N/A	#N/A	15(A)	Zero	#N/A	MCL
Magnesium	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Manganese	1370	183	50(S)	#N/A	10000	700
Mercury	82.1	11	2	2	20	MCL
Nickel	5480	730	100	100	2000	MCL
Potassium	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Selenium	1370	183	50	50	400	MCL
Silver	1370	183	100(S)	#N/A	400	200
Sodium	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Thallium	21.9	2.92	2	0.5	6	MCL
Tin	164000	21900	#N/A	#N/A	50000	20000
Vanadium	1920	256	#N/A	#N/A	500	200
Zinc	82100	11000	5000(S)	#N/A	20000	10000

#N/A = Not available

ARAR = Applicable or Relevant and Appropriate Requirements. (P)=Proposed (S)=Secondary standard
PRG = Preliminary Remediation Goal (health-based). (A)=Action Level
(T) = this value for total trihalomethanes. (U) = Under review.
MCLs and MCLGs are from "Drinking Water Regulations and Health Advisories", U.S. EPA, May 1994.
Action Levels were calculated according to the recommended assumptions given in the propsed Subpart S rules.

TABLE 5.2

INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Environmental Media	General Response Action	Remedial Technology	Process Option	Retain For Further Analysis	Screening Comments
Soils	No Action	None	Not Applicable	Yes	The No Action Alternative will be carried through to the Detailed Analysis of Alternatives.
	Institutional Action	Access Restriction	Deed Restrictions	Yes	Restrictions on excavation and soil use in impacted areas may be applicable. Must be coordinated with property owner(s) and public agencies.
			Site Fencing	No	Impacted soils are mainly at a depth of >15 feet. Restricting access to site will not affect potential contact with impacted soils.
		Monitoring	Soil Monitoring	Yes	On-going monitoring of site soils may be applicable.
	Surface Water Diversion	Surface Controls	Grading	No	Site already graded for runoff control.
			Soil Cover/ Revegetation	No	Site already has vegetative cover or paving.
			Flood Control Dikes	No	Not necessary due to site elevation and stratigraphy.

TABLE 5.2

INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Environmental Media	General Response Action	Remedial Technology	Process Option	Retain For Further Analysis	Screening Comments
Soils (cont.)	Containment	Capping (single layer)	Synthetic Membrane	No	May minimize surface water infiltration, but will not affect groundwater flow through impacted soil.
			Natural Soil	No	Site already has natural soil cover.
			Clay	No	May minimize surface water infiltration, but will not affect groundwater flow through impacted soil.
			Asphalt	No	May minimize surface water infiltration, but will not affect groundwater flow through impacted soil.
			Concrete	No	May minimize surface water infiltration, but will not affect groundwater flow through impacted soil.
		Capping (multi-layer)	Multimedia	No	May minimize surface water infiltration, but will not affect groundwater flow through impacted soil.
		Vertical Barriers	Slurry Wall	No	Hydrogeology and vertical extent of groundwater site will limit the effectiveness of a slurry wall.
			Vibrating Beam Bitumen Grout Wall	No	Forms barrier with uncertain integrity due to difficulty in sealing base of wall.

TABLE 5.2

INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Environmental Media	General Response Action	Remedial Technology	Process Option	Retain For Further Analysis	Screening Comments
Soils (cont.)	Containment (cont.)	Vertical Barriers (cont.)	Grout Curtain	No	Forms barrier of uncertain integrity.
			Metallic Sheet	No	Presence of storm and sanitary sewers in area will not allow driving of sheet pile.
			Concrete Wall	No	Freeze/thaw stresses will cause cracking of concrete, producing a barrier of uncertain integrity.
			Clay Wall	No	May be effective in limiting migration of contaminants from source area.
		Horizontal Barriers	Block Displacement	No	Horizontal barrier is not beneficial for impacted soil below the water table where there is lateral groundwater movement.
			Injection Grouting	No	Horizontal barrier is not beneficial for impacted soil below the water table where there is lateral groundwater movement.
	Removal	Excavation	Mechanical Excavation	Yes	Localized excavation of impacted soils may be effective; either independently or coupled with other technologies. Most impacted soils are at depths >15 feet.
			Consolidation	No	Estimated volumes of soils and type of contamination inappropriate for consolidation.

TABLE 5.2

INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Environmental Media	General Response Action	Remedial Technology	Process Option	Retain For Further Analysis	Screening Comments
Soils (cont.)	On-site Treatment	Thermal Oxidation	Rotary Kiln	No	Volume of impacted soil is too small for on-site incineration.
			Liquid Injection	No	Not applicable due to contaminant characteristics.
			Fluidized Bed	No	Not applicable due to contaminant characteristics.
			Infrared	No	Volume of impacted soil is too small for on-site incineration.
		Direct Treatment	Aeration	Yes	May be effective in removing contaminants from soil.
			Slurry Degradation	No	Inappropriate due to contaminant characteristics.
			Low Temperature Thermal Desorption	Yes	May be effective in removing contaminants from soil.
			Soil Washing	No	Inappropriate due to volatile nature of contaminants.

TABLE 5.2

INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Environmental Media	General Response Action	Remedial Technology	Process Option	Retain For Further Analysis	Screening Comments
Soils (cont.)	On-Site Treatment (cont.)	In-Situ Treatment	Microbial Degradation	No	Lack of performance data on chlorinated contaminants.
			Oxidation (chemical detoxification)	No	Inappropriate due to aromatic nature of contaminants.
			Stabilization/ Solidification	No	Inappropriate due to contaminant characteristics.
			Soil Flushing	Yes	May be effective in enhancing removal of contaminants from soil matrix.
			Soil Aeration	Yes	May be effective in removing contaminants from soil matrix.
			Soil Vapor Extraction	Yes	May be effective in removing contaminants from soil matrix.
			Vitrification	No	Cannot be implemented due to site conditions, high water table.

TABLE 5.2

INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Environmental Media	General Response Action	Remedial Technology	Process Option	Retain For Further Analysis	Screening Comments
Soils (cont.)	Off-Site Treatment	RCRA Incineration	Incineration	Yes	Incineration may be required for off-site disposal.
	On-Site Disposal	RCRA Landfill Construction	Not Applicable	No	Physical location of site makes it inappropriate for constructing a landfill.
		Type II Landfill Construction	Not Applicable	No	Physical location of site makes it inappropriate for constructing a landfill.
	Off-Site Disposal	RCRA Landfill	Not Applicable	No	Incineration required prior to disposal. RCRA landfill is not required.
		Type II Landfill	Not Applicable	Yes	Following incineration, soil can be disposed of in a Type II landfill.

TABLE 5.2

INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Environmental Media	General Response Action	Remedial Technology	Process Option	Retain For Further Analysis	Screening Comments
Groundwater	No Action	None	Not Applicable	Yes	The No Action Alternative will be carried through to the Detailed Analysis of Alternatives.
	Institutional Action	Access Restriction	Deed Restrictions	Yes	Deed restrictions on well installation and groundwater use may be appropriate.
			Site Fencing	No	Site fencing will not restrict groundwater exposure.
		Monitoring	Groundwater Monitoring	Yes	On-going monitoring of on-site and off-site wells may be applicable.
	Surface Water Diversion	Surface Controls	Grading	No	May be applicable if soil excavation is utilized, but will not affect groundwater flow through impacted soil.
			Soil Cover/ Revegetation	No	Site already has vegetative cover or paving.
			Flood Control Dikes	No	Not necessary due to site elevation and stratigraphy.

TABLE 5.2

INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Environmental Media	General Response Action	Remedial Technology	Process Option	Retain For Further Analysis	Screening Comments
Groundwater (cont.)	Containment	Capping (single layer)	Synthetic Membrane	No	May minimize surface water infiltration, but will not impact upstream recharge of groundwater and leaching of contaminants.
			Clay	No	May minimize surface water infiltration, but will not impact upstream recharge of groundwater and leaching of contaminants.
			Asphalt	No	May minimize surface water infiltration, but will not impact upstream recharge of groundwater and leaching of contaminants.
			Concrete	No	May minimize surface water infiltration, but will not impact upstream recharge of groundwater and leaching of contaminants.
		Capping (multi-layer)	Multimedia	No	May minimize surface water infiltration, but will not impact upstream recharge of groundwater and leaching of contaminants.
		Vertical Barriers	Slurry Wall	No	Hydrogeology of the site would limit the effectiveness of a slurry wall.
			Vibrating Beam Bitumen Grout Wall	No	Forms barrier of uncertain integrity, due to difficulty in sealing base of wall.
			Grout Curtain	No	Forms barrier of uncertain integrity.

TABLE 5.2

INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Environmental Media	General Response Action	Remedial Technology	Process Option	Retain For Further Analysis	Screening Comments
Groundwater (cont.)	Containment (cont.)	Vertical Barriers (cont.)	Metallic Sheet Piling	No	Presence of storm and sewers in area will not allow driving of sheet pile.
			Concrete wall	No	Subject to cracking due to freeze/thaw stresses.
		Horizontal Barriers	Block Displacement	No	Horizontal barrier is not effective for lateral groundwater movement.
			Grout Injection	No	Technology not sufficiently developed. Produces a barrier of uncertain integrity.
		Gradient Controls	Barrier Wells	Yes	May be effective in containing groundwater and/ or lowering the groundwater table level.
			Interceptor Trenches/ Drains/Sumps	No	Site geology is more conducive to groundwater diversion via wells.
	Collection	Extraction	Extraction Wells	Yes	May be an effective method of collecting groundwater for treatment and/or lowering the groundwater table level.
		Passive Collection	Interceptor Trenches/ Drains/Sumps	No	Site geology is more conducive to groundwater collection via wells.
	On-Site Treatment	Biological Treatment (Aerobic)	Activated Sludge	No	Aerobic biological treatment of chlorinated VOCs is not well documented or effective unless a co-substrate is available.

TABLE 5.2

INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Environmental Media	General Response Action	Remedial Technology	Process Option	Retain For Further Analysis	Screening Comments
Groundwater (cont.)	On-Site Treatment (cont.)	Biological Treatment (aerobic) (cont.)	Trickling Filters	No	Aerobic biological treatment of chlorinated VOCs is not well documented or effective unless a co-substrate is available.
			Rotating Biological (Contractor)	No	Aerobic biological treatment of chlorinated VOCs is not well documented or effective unless a co-substrate is available.
			Aerated Lagoons	No	Aerobic biological treatment of chlorinated VOCs is not well documented or effective unless a co-substrate is available.
		Biological Treatment (anaerobic)	Anaerobic Digestion	No	Has been shown to dechlorinate contaminants, but may require additional treatment.
			Anaerobic Fluidized Bed	No	Has been shown to dechlorinate contaminants, but may require additional treatment.
		Biophysical Treatment	PACT Treatment	No	Aerobic biological treatment of chlorinated VOCs is well documented or effective unless a co-substrate is available.
			Aerobic Carbon Fluidized Bed	No	Aerobic biological treatment of chlorinated VOCs is well documented or effective unless a co-substrate is available.
		Chemical Treatment	Neutralization	No	Not applicable due to contaminant characteristics.
			Precipitation	No	Not applicable due to contaminant characteristics.

TABLE 5.2

INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Environmental Media	General Response Action	Remedial Technology	Process Option	Retain For Further Analysis	Screening Comments
Groundwater (cont.)	On-Site Treatment (cont.)	Chemical Treatment (cont.)	Dechlorination	No	Has been shown to be effective, but would require additional treatment.
			Oxidation	No	Technology is appropriate but prohibitively expensive.
			UV Enhanced Oxidation	No	Technology is appropriate but prohibitively expensive.
			Reduction	No	Not applicable due to contaminant characteristics.
		Physical Treatment	Coagulation/ Sedimentation	No	Not applicable due to contaminant characteristics.
			Carbon Adsorption	Yes	Proven effective in removing VOCs.
			Activated Alumina Adsorption	No	Not applicable due to nature of contamination.
			Ion Exchange	No	Not applicable due to nature of contamination.
			Reverse Osmosis	No	Not applicable due to nature of contamination.
			Air Stripping	Yes	Proven effective in removing VOCs.
			Steam Stripping	No	Effective in removing VOCs, but air stripping would prove more cost effective.
			Filtration	No	Not applicable due to nature of contamination.
			Dissolved Air Flotation	No	Not applicable due to nature of contamination.

TABLE 5.2

INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Environmental Media	General Response Action	Remedial Technology	Process Option	Retain For Further Analysis	Screening Comments
Groundwater (cont.)	On-Site Treatment (cont.)	Physical Treatment (cont.)	Extraction	No	Generates additional contamination in wastewater stream. Inefficient means of water treatment.
			Solar Evaporation	No	Not applicable due to site conditions and nature of contamination.
			Spray Evaporation	No	The No Action Alternative will be carried through to the Detailed Analysis of Alternatives.
	Effluent Disposal	Publicly owned treatment works (POTW)	Not Applicable	Yes	May be appropriate for disposal of groundwater.
		Direct Discharge	Not Applicable	Yes	May be appropriate if contaminant levels are sufficiently reduced. Requires NPDES permit.
		Reinjection for Soil Flushing	Injection Wells or Reinfiltration Galleries	Yes	May be appropriate if contaminant levels are sufficiently reduced. Requires reinjection permit or permit exemption.
		In-Situ Treatment	Microbial Degradation	No	Lack of performance data on chlorinated contaminants.
			Chemical Treatment	No	Not applicable due to nature of contamination.

TABLE 5.2

INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Environmental Media	General Response Action	Remedial Technology	Process Option	Retain For Further Analysis	Screening Comments
	Off-Site Treatment	POTW	Not Applicable	Yes	May be an effective means of groundwater treatment.
		RCRA Facility	Not Applicable	No	Concentrations of contaminants in the ground water are not high enough to warrant this type of treatment.
	On-Site Disposal	Deep Well Injection	Not Applicable	No	Requires installation of well through bedrock. May cause contamination of deeper aquifers.
Air	No Action	None	Not Applicable	Yes	The No Action Alternative will be carried through to the Detailed Analysis of Alternatives.
	Institutional Action	Access Restriction	Entry Permit Program	Yes	May be effective in reducing potential exposure to gas in sewer lines.
		Monitoring	Air Monitoring/ Confined Space Tests	Yes	On-going monitoring of site air quality and confined space monitoring of sewer air may be applicable.
	On-Site Treatment	Gas Recovery/ Treatment	Adsorption	Yes	May be appropriate in conjunction with vapors generated by soil/groundwater treatment.
			Thermal Oxidation	Yes	May be appropriate in conjunction with vapors generated by soil/groundwater treatment.
			Flare	No	Marginally effective for chlorinated VOCs.

TABLE 5.3

SUMMARY OF CORRECTIVE MEASURE ALTERNATIVES

Former Amphenol Site
Franklin, Indiana

Alternative Number	Corrective Measure Technologies
1	No Action
2	Institutional Controls; Monitoring
2A	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM)
3	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM); Groundwater Sparging; Soil Vapor Extraction
4	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM); Soil Excavation, Aeration, and Backfill
4A	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM); Soil Excavation and Off-Site Disposal
5	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM); Focused Groundwater Sparging and Soil Vapor Extraction
6	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM) and Activated Carbon Polishing; Reinjection of Treated Water to Promote Soil Flushing

TABLE 6.1

EVALUATION OF CORRECTIVE MEASURE ALTERNATIVES BASED ON ABILITY TO ACHIEVE ENVIRONMENTAL, INSTITUTIONAL, AND TECHNICAL CRITERIA

Alternative	CorrectiveMeasure Technologies	Corrective Measure Evaluation Criteria				
		Environmental	Institutional	Technical		
				Soil	Groundwater	Surface Water
1	No Action	low	low	low	low	low
2	Institutional Controls; Monitoring	low	high	low	low	low
2A	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM)	high	high	moderate	high	high
3	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM); Groundwater Sparging; Soil Vapor Extraction	high	high	high	high	high
4	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM); Soil Excavation, Aeration, and Backfill	high	high	moderate	moderate	high
4A	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM); Soil Excavation and Off-site Disposal	high	high	moderate	moderate	high
5	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM); Focused Groundwater Sparging and Soil Vapor Extraction	high	high	high	high	high
6	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM) and Activated Carbon Polishing; Reinjection of Treated Water to Promote Soil Flushing	high	high	moderate	high	high

Note: Evaluation is based on the liklihood of each corrective measure to meet the stated criteria.

TABLE 7.1

CAPITAL AND ANNUAL OPERATING COST SUMMARY FOR CORRECTIVE MEASURE ALTERNATIVES

Former Amphenol Site
Franklin, Indiana

Alternative Number	Corrective Measure Technologies	Capital Cost ($)*	Annual Operating Cost ($)
1	No Action	NA	NA
2	Institutional Controls; Monitoring	24,000	33,000
2A	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM)	24,000	76,000
3	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM); Groundwater Sparging; Soil Vapor Extraction	182,000	117,000
4	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM); Soil Excavation, Aeration, and Backfill	125,000	76,000
4A	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM); Soil Excavation and Off-Site Disposal	1,347,000	76,000
5	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM); Focused Groundwater Sparging and Soil Vapor Extraction	119,000	111,000
6	Institutional Controls; Monitoring; Groundwater Extraction and Treatment with Air Stripping (ICM) and Activated Carbon Polishing; Reinjection of Treated Water to Promote Soil Flushing	72,000	84,000

* Capital costs previously incurred for the ICM are not included.